How to use this document

This is the outline of the Mathematics Mastery secondary curriculum plan, designed for use by school leaders and teachers in schools in the Mathematics Mastery partnership. We are happy to share this programme of study with schools beyond this community in order to support preparation for and implementation of the new National Curriculum, but please bear in mind that it is designed to be used in conjunction with the detailed Mathematics Mastery unit guides and resources.

The curriculum is cumulative in nature; we therefore expect teachers to adhere to the order of topics as presented to ensure that students have a depth of understanding of the basic skills and prerequisites of topics due to be taught later in the term. In particular, it is important not to accelerate through content, e.g. "extending" students by covering material designed for different year groups. This is in line with the guidance from the 2014 National Curriculum:

> *Pupils who grasp concepts rapidly should be challenged through being offered rich and sophisticated problems before any acceleration through new content in preparation for key stage 4. Those who are not sufficiently fluent should consolidate their understanding, including through additional practice, before moving on.*

The belief that every child can succeed in mathematics, regardless of background and prior attainment, is fundamental to Mathematics Mastery. In planning from this document for each of the first three years of the secondary programme, it is expected that teachers will start with the highlighted "middle" row that represents the expectations for all students in each year group. As some students may need extra support to access this material, coaching resources are being developed to support the topics listed in the upper rows. Similarly, ideas will be provided to challenge students' depth of understanding, whilst still remaining in the same topic area, as indicated by the bottom rows. Final preparation for GCSE in the last two years works in a similar way: all students are expected to cover at least the "middle row" but some may need consolidation of the material in the top row before or alongside the core material. Many students will also be able to access and excel at the higher-level material, especially those who grasp the core material quickly. All these issues will be covered in greater detail in the training given to schools and through supporting material on the Mathematics Mastery toolkit.

Year 7

Autumn 1 Solve word problems (add and subtract)	Autumn 2 Explain and investigate (multiply and divide)	Spring 1 Geometry	Spring 2 Fractions	Summer 1 Applications of algebra	Summer 2 Percentages and statistics
Some might need to recap: • Number bonds • Convert units • Money +/– • Measurement	Some might need to recap: • Mental strategies • Multiplication facts • Multiplication strategies • Solve number problems	Some might need to recap: • Lengths and units • Parallel and perpendicular • Work with angles • Division and the mean	Some might need to recap: • Equal parts • Factors and multiples • Tenths and hundredths • Word problems • Fractional areas	Some might need to recap: • Areas of rectangles and triangles • Number patterns • Algebraic notation • Triangle and quadrilateral properties	Some might need to recap: • Decimals and problem solving • Fractions of shapes • Equivalence • Order of operations
Core Learning • Place value (including decimals) • Zog numbers • Maya numbers • Add and subtract (including decimals) • Rounding to dp • Perimeter • Mental strategies • Use of bar models to create inequalities and equations (new slides Unit 6, week 2, slides 4-12, 19, 20, 30-33, 43-46)	**Core Learning** • Factors, multiples, square root and squaring • Multiply and divide (including decimals) • Multiply fractions using area model (see slide 19 Unit 7) • Area of rectangle, triangle and parallelogram • Calculate the mean	**Core Learning** • Draw and measure angles • Construct ASA and SAS triangles • Find unknown angles (straight lines, at a point, vertically opposite) • Properties of triangles and quadrilaterals • Unit conversions (linear) • Symmetry and tessellation	**Core Learning** • Make meaning of vinculum explixit (division) • Equivalent fractions • Compare and order fractions and decimals • Change mixed numbers to improper fractions and vice versa • Fraction of a quantity • Multiply and divide fractions	**Core Learning** • To be taught first: Add on a negative number to any number • Order of operations • Substitute positive numbers into more complex expressions • Form and simplify algebraic expressions • Expand over a single bracket, and factorise • Sequences (term-to-term only, **not** nth term)	**Core Learning** • Percentage of a quantity • Find the whole, given the part and the percentage • Convert between percentages, vulgar fractions and decimals • Construct and interpret statistical diagrams including pie charts
Highest attaining students may be stretched through depth by consideration of the following:					
• More complex algebraic expressions from perimeters • Different counting systems or bases (Base 60 for time; new slides) • Upper and lower bounds	• Cube root and cubes • Area problems with algebra element • Multiply very simple algebraic fractions • Multiply/divide in different bases • Alternative methods of multiplication	• Form and solve simple equations from angle problems • Allied Angles • Tessellating triangles and quadrilaterals	• Multiply/divide with mixed numbers • Multiply/divide simple algebraic fractions • Terminating and recurring decimals	• Factorise more complex linear expressions • Simplify simple algebraic fractions • Calculate mean including negative numbers • Four fours • Algebraic mean questions • UKMT Junior maths challenge •	• Comparing and converting between representations • Misleading data • Real life data • Applications of percentages

This framework follows the content and assessment objectives set out by DfE and Ofqual and, hence, reflects the requirements of GCSE mathematics offered by AQA, Eduqas, OCR and Pearson.

Year 8

Autumn 1 Number	Autumn 2 Algebraic expressions	Spring 1 2-D geometry	Spring 2 Proportional reasoning	Summer 1 3-D geometry	Summer 2 Statistics
All should be confident and competent with Year 7 material. Review of these prerequisites may be useful for each unit:					
Some might need to recap: • Factors, multiples and primes • Multiplication and division • Fraction equivalence and calculations	Some might need to recap: • Problem solving with fractions • Order of operations • Form algebraic expressions • Substitution	Some might need to recap: • Angle types • Angle facts • Rectangle and triangle areas • ×/÷ by powers of 10 • Problem solving with negative numbers	Some might need to recap: • Rounding • Bar modelling with factions • Fraction ×/÷ • Bar modelling with equations • FDP equivalence	Some might need to recap: • Rectilinear areas • Fraction +/− • Problem solving with fractions • Percentage increase and decrease • Substitution with negatives	Some might need to recap: • Statistical diagrams • Ratio and rate • The mean • Calculator skills and rounding
All will have access to this specific Key Stage 3 content:					
Core Learning • Primes and indices • Prime factorisation, squares and cubes • Use of Venn diagrams to find LCM and HCF • Add and subtract fractions and mixed numbers	**Core Learning** • Order and calculate with negative numbers • Form and solve linear equations (unknowns on one side) • Form and solve linear equations with unknowns on both sides, positive terms only ($ax+b=cx+d$) • Use more complex algebraic expressions • Linear sequences: nth term • Coordinates and ploting linear sequences	**Core Learning** • Construct triangles and quadrilaterals, including SSS triangles • Calculate unknown angles (including parallel lines) • Unit conversions (including area) • Area of a trapezium • Areas and perimeters of composite figures	**Core Learning** • Percentage increase and decrease, including multipliers • Ratio (equivalent, of a quantity) and rate • Scaling and multipliers • Speed, distance, time	**Core Learning** • Round to significant figures and estimation • Circumference and area of a circle • Visualise and identify 3-D shapes and their nets • Volume of cuboid, prism, cylinder, composite solids • Surface area	**Core Learning** • Collect and organise data, including surveys • Interpret and compare statistical representations • Mean, median and mode averages • The range and outliers
Highest attaining students may be stretched through depth by consideration of the following:					
• Agebraic fractions • Extension questions on factors, multiples and primes (see JMC, NRich, donsteward) • Egyptian fractions • Continued fractions	• Linear equations with unknowns on both sides, negative terms and fractions • Explore non-linear sequences • T-totals	• Form and solve equations from all these contexts • Similarity, scale factor and ratio • Complex constructions • Simple angle proofs (eg. proof of angle sum in triangles using parallel lines)	• Reverse percentage problems • Density and other compound measures (pressure, flow rate, acceleration) • Problems involving algebra • S-D-T problems that require conversion of units • Area scale factors • Loan repayment	• Higher GCSE questions involving volume, SA and algebra • SA of cylinders, cones, spheres • Platonic solids • Percentage errors • Plans and elevations	• Distribution of data and outliers (new scheme Spring 1) • Misleading graphs • Equal width histograms • Sampling methods

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Year 9

Autumn 1 Graphs and proportion	Autumn 2 Algebraic expressions	Spring 1 2-D geometry	Spring 2 Equations and inequalities	Summer 1 Statistics	Summer 2 Geometry
All should be confident and competent with Year 7 and 8 materials. Review of these prerequisites may be useful for each unit:					
Some might need to recap: • Read scales • Linear equations • Proportion • Percentage increase and decrease	Some might need to recap: • Make expressions • Expressions and area • Substitution • Powers and roots • Problem solving with a calculator	Some might need to recap: • Area and circumference • Angles on lines and in triangles • Angles in parallel lines • Pie charts	Some might need to recap: • Linear graphs • Sequences • Manipulate formulae • Problem solving with algebra	Some might need to recap: • FDP conversion • Number problems with fractions and decimals • Averages and the range • Venn diagrams and two-way tables	Some might need to recap: • Compound areas • Powers of 10 and standard form • Problem solving with algebra
Throughout Year 9 • Approximation and significant figures • Addition, subtraction, multiplication and division with whole numbers, fractions and decimals • Percentage increase and decrease, finding the whole given the part and the percentage					
Core Learning • Cartesian coordinates including midpoint of a line segment • Linear graphs • Direct and inverse proportion • Calculate with scales • Standard form	**Core Learning** • Sequences including arithmetic and geometric • Expand binomials and factorise simple quadratics • Change the subject of familiar formulae	**Core Learning** • Construction and loci • Congruence and similarity • Pythagoras' theorem • Angles in polygons	**Core Learning** • Construct and solve equations and inequalities (unknowns on both sides is a recap from y8; introduce negative terms) • Graphical solutions to simultaneous linear equations • Quadratic and other graphs	**Core Learning** • Probability • Mean of grouped data • Compare two data sets • Scatter graphs • Sets and Venn diagrams (New y9 SoW Autumn; new slides to follow 21_22)	**Core Learning** • Similarity and Enlargement' • Transformations (translation, rotation, reflection) • Exploring trigonometry (focus on one ratio only with lower ability)
Highest attaining students may be stretched through depth by consideration of the following:					
• New y9 SoW Summer; new slides to follow 21_22: Compound percentage change • Reverse percentage change • 3-D coordinates • Explore linear and non-linear graphs	• New y9 SoW Aut 2; new slides to follow 21_22: Plot quadratic graphs Solve quadratic equations Complete the square Turning points • Algebraic proof	• Bearings • Geometrical proof • Euclidean geometry • 3-D Pythagoras • Complex constructions	• Solve linear sim. equ. • Solve quadratic sim. equ. • Solve quadratic inequalities • Regions on graphs • Linear programming • Modelling	• Equations of lines of best fit • New y8 SoW Spring: Interpolation and extrapolation; new slides to follow 20_21 • GCSE questions on sets / Venn diagrams • Probability problems	• Trigonometry • Further trigonometry • Surds (New y9 SoW Spring; new slides to follow 21_22) • Multiple transformations

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Year 10

Autumn 1 Number	Autumn 2 Geometry Applications of Algebra	Spring 1 Reasoning Percentages and Probability	Spring 2 Geometry	Summer 1 Similarity	Summer 2 Data Handling
All should be confident and competent in Key Stage 3 material. Review of these prerequisites may be useful for each unit:					
• Y8U1 Prime numbers and factorisation • Y8U1 Squares and roots • Y9U4 Scales and standard form • Y7U4 Decimals • Y8U4 and Y9U5 Sequences	• Real-life graphs • Y8U4, Y9U6, Y9U7 KS3 algebra review (Sequences, equations, expressions, expanding, factorising, change subject) • Y9U13 Graphical solutions • Y9U5 Sim. Equ.	• Y7U16, Y7U20 Y8U2, Y8U7 KS3 FDP review • Y9U14 Probability	• Y9U17, Y9U18 Similarity, Enlargement, Transformations • Y8U6, Y8U9, Y8U10 Area (trapezia, circles, parallelograms), rounding • Y8U11 3D shapes and nets • U8U12 Volume and SA • Units • Derive and use formulae, expressions and equations	• Y8U8 Ratio and rate • Y9U3 Proportion • Y9U10 Pythagoras • Y9U17, Y9U19 Similarity, Enlargement, Trigonometry	• Y7U21, Y8U13, Y9U15 Data • Y9U16 Scatter diagrams • Averages and the range • Estimation
All will be assessed on this specific Key Stage 4 content					
• Factors, multiples, primes • Powers and root • Calculations with and rules of indices • Standard form • Arithmetic and geometric sequences	• Expand and factorise binomials • Quadratic equations (factorising) • Linear simultaneous equations (algebraically and graphically) • Graphical solutions of equations • Quadratic graphs	• Percentages • Compound interest • Growth/decay • Sets • Theoretical and experimental probability • Relative frequency • Probability of combined events, including tree diagrams • Venn diagrams • Sample space diagrams and listing	• Transformations • Area and perimeter of 2D shapes, including composite shapes • Area of a sector and arc length • Properties of 3-D shapes; their plans and elevations • Surface area and volume of cuboids and cylinders (including exact answers) • Limits of accuracy and error intervals	• Ratio review • Direct and inverse proportion • Compound measures (density, speed, pressure) • Pythagoras' theorem • Similarity • Trigonometry in right angled triangles, including use of exact values	• Data collection and sampling • Represent and describe distributions • Presenting data: bar chart, pie chart, line graphs, scatter diagrams • Correlation and lines of best fit • Identify misleading graphs • Outliers • Time series
Highest attaining students will also be assessed on the following material, which provides good preparation for Key Stage 5					
• Surds and irrational numbers • Rationalise denominators • Recurring decimals • Fractional and negative indices • Calculations in SF • Quadratic sequences	• Factorise quadratics when a>1 in ax² • Complete the square • Quadratic formula • Algebraic fractions • Further simultaneous equations (ie quadratic) • Cubic, reciprocal and exponential graphs	• Conditional probability • Set notation	• Negative scale factors of enlargement • Combined transformations • Upper and lower bounds • Volume and surface area of spheres, cones and pyramids	• Direct/inverse proportion with powers/roots • Trigonometry in non-right angled triangles • 3D trigonometry • 3D Pythagoras • Similar areas and volumes	• Histograms with equal and unequal class intervals • Cumulative frequency graphs and box plots • Compare distributions

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Throughout KS4: Students will need to keep working on key skills as they occur within other topics, as well as when the skills are being explicitly addressed. These include: Addition, subtraction, multiplication and division; order of operations; fractions, decimals and percentages; rounding and estimation; and algebraic notation.

Year 11

Autumn 1 Reasoning and Proof	Autumn 2 Graphs	Spring 1 Algebra and Graphs	Spring 2 Revision, extension 2	Summer 1 Revision, extension 3	Summer 2 Examinations
All should be confident and competent in Key Stage 3 material. Review of these prerequisites may be useful for each unit:					
• Y8U8 Ratio • Y7U10, Y8U5, Y9U11 angle facts, angles on parallel lines, angles in polygons • Y9U9 Congruence • Y9U8 Constructions	• Y9U12 Inequalities • Y9U1, Y9U2 Linear graphs • Y9U13 Non-linear graphs • Real-life graphs • Deriving and using expressions, formulae and equations • Substitution	• Review and revision	• Review and revision	• Review and revision	• Review and revision
All will be assessed on this specific Key Stage 4 content					
• Vectors • Geometric reasoning: angle fact in various contexts, including angles in polygons • Bearings • Congruence (SSS, ASA, AAS, RHS) and proof • Construct triangles and quadrilaterals • Standard ruler and compass constructions • Loci	• Linear inequalities • Linear graphs • Non-linear graphs (quadratic, cubic) • Parallel lines	• Review and revision	• Review and revision	• Review and revision	• Review and revision
Highest attaining students will also be assessed on the following material, which provides good preparation for Key Stage 5					
• More complex vector problems • Apply and prove circle theorems • Gradients of curves and areas under graphs • Equations of a circle and the tangent to a circle	• Trig graphs • Reciprocal and exponential graphs • Quadratic inequalities	• Algebraic proof and reasoning: more comlex rearranging, perpendicular lines, equivalent expressions etc. • Iteration (recurrence relations) • Functions and their inverses • Composite functions	• Review and revision	• Review and revision	• Review and revision

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		• Transformation of graphs			
Throughout KS4: Students will need to keep working on key skills as they occur within other topics, as well as when the skills are being explicitly addressed. These include: Addition, subtraction, multiplication and division; order of operations; fractions, decimals and percentages; rounding and estimation; and algebraic notation.					